AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

Claims 1-23 (Canceled)

24. (New) An apparatus for generating a three-phase pulse-width-modulation signal for a three-phase voltage inverter employing a semiconductor switching element, the apparatus comprising:

a generating unit that generates the three-phase pulse-width-modulation signal based on a combination of three basic voltage vectors and a zero vector.

25. (New) The apparatus according to claim 24, wherein

the generating unit includes

a creating unit that creates two basic voltage vectors having a phase difference of 60 degrees and at least a zero vector by allocating occurrence time ratios for two basic voltage vectors having a phase difference of 60 degrees with a voltage command vector therebetween and a corresponding zero vector based on the voltage command vector; and

a distributing unit that distributes an occurrence time ratio of the voltage command vector to three basic voltage vectors having a phase difference of 120 degrees including one of the two basic voltage vectors having a phase difference of 60 degrees, using three vectors with equal lengths having a phase

difference of 120 degrees and constituting a zero vector corresponding to the voltage command vector, to create three basic voltage vectors having a phase difference of 60 degrees and a zero vector based on the occurrence time ratio distributed.

26. (New) The apparatus according to claim 24, wherein

the generating unit includes

a creating unit that creates two basic voltage vectors having a phase difference of 60 degrees and at least a zero vector by allocating occurrence time ratios for two basic voltage vectors having a phase difference of 60 degrees with a voltage command vector therebetween and a corresponding zero vector based on the voltage command vector; and

a distributing unit that distributes an occurrence time ratio of the voltage command vector to three basic voltage vectors having a phase difference of 120 degrees including one of the two basic voltage vectors having a phase difference of 60 degrees, using three vectors with equal lengths having a phase difference of 120 degrees and constituting a zero vector corresponding to the voltage command vector, to create three basic voltage vectors having a phase difference of 60 degrees and a zero vector based on the occurrence time ratio distributed, with an occurrence time ratio of a basic voltage vector in a middle of the three basic voltage vectors having a phase difference of 60 degrees set to a predetermined value.

27. (New) The apparatus according to claim 25, further comprising:

a switching unit that switches between a first mode and a second mode based on at least one of a load status, an operation frequency, and a range of angle of an

inverter rotation angle of an electric motor that is driven by the three-phase voltage inverter, wherein

the first mode generates the three-phase pulse-width-modulation signal using the two basic voltage vectors and the at least a zero vector created by the creating unit, and

the second mode generates the three-phase pulse-width-modulation signal using the three basic voltage vectors and the zero vector created by the distributing unit.

28. (New) The apparatus according to claim 26, further comprising:

a switching unit that switches between a first mode and a second mode based on at least one of a load status, an operation frequency, and a range of angle of an inverter rotation angle of an electric motor that is driven by the three-phase voltage inverter, wherein

the first mode generates the three-phase pulse-width-modulation signal using the two basic voltage vectors and the at least a zero vector created by the creating unit, and

the second mode generates the three-phase pulse-width-modulation signal using the three basic voltage vectors and the zero vector created by the distributing unit.

29. (New) The apparatus according to claim 24, wherein

the generating unit includes

a creating unit that creates two basic voltage vectors having a phase difference of 60 degrees and at least a zero vector by allocating occurrence time ratios for two basic voltage vectors having a phase difference of 60 degrees with a voltage command vector therebetween and a corresponding zero vector based on the voltage command vector; and

a distributing unit that distributes an occurrence time ratio of the voltage command vector to three basic voltage vectors having a phase difference of 120 degrees including one of the two basic voltage vectors having a phase difference of 60 degrees, using three vectors with equal lengths having a phase difference of 120 degrees and constituting a zero vector corresponding to the voltage command vector, to create three basic voltage vectors having a phase difference of 120 degrees and at least a zero vector based on the occurrence time ratio distributed.

30. (New) The apparatus according to claim 29, further comprising:

a switching unit that switches between a first mode and a second mode based on at least one of a load status, an operation frequency, and a range of angle of an inverter rotation angle of an electric motor that is driven by the three-phase voltage inverter, wherein

the first mode generates the three-phase pulse-width-modulation signal using the two basic voltage vectors and the at least a zero vector created by the creating unit, and

the second mode generates the three-phase pulse-width-modulation signal using the three basic voltage vectors and the at least a zero vector created by the distributing unit.

31. (New) The apparatus according to claim 24, wherein

the generating unit includes

a creating unit that creates two basic voltage vectors having a phase difference of 60 degrees and at least a zero vector by allocating occurrence time ratios for two basic voltage vectors having a phase difference of 60 degrees with a voltage command vector therebetween and a corresponding zero vector based on the voltage command vector; and

a distributing unit that distributes an occurrence time ratio of the voltage command vector to three basic voltage vectors having a phase difference of 120 degrees including one of the two basic voltage vectors having a phase difference of 60 degrees, using three vectors with equal lengths having a phase difference of 120 degrees and constituting a zero vector corresponding to the voltage command vector, to create,

when an operation request range on a low speed side is not stringent, a first combination of three basic voltage vectors having a phase difference of 60 degrees and at least a zero vector based on the occurrence time ratio distributed, and

when the operation request range on a low speed side is stringent, a second combination of three basic voltage vectors having a phase difference of 120 degrees and at least a zero vector based on the occurrence time ratio distributed.

32. (New) The apparatus according to claim 31, further comprising:

a switching unit that switches between a first mode and a second mode based on at least one of a load status, an operation frequency, and a range of angle of an inverter rotation angle of an electric motor that is driven by the three-phase voltage inverter, wherein

the first mode generates the three-phase pulse-width-modulation signal using the two basic voltage vectors and the at least a zero vector created by the creating unit, and

the second mode generates the three-phase pulse-width-modulation signal using either one of the first combination and the second combination, in a switchable manner.

33. (New) An apparatus for generating a three-phase pulse-width-modulation signal for a three-phase voltage inverter employing a semiconductor switching element, the apparatus comprising:

a generating unit that generates the three-phase pulse-width-modulation signal based on a combination of three basic voltage vectors and two zero vectors.

34. (New) The apparatus according to claim 33, wherein

the generating unit includes

a creating unit that creates two basic voltage vectors having a phase difference of 60 degrees and at least a zero vector by allocating occurrence time ratios for two basic voltage vectors having a phase difference of 60 degrees with a

voltage command vector therebetween and a corresponding zero vector based on the voltage command vector; and

a distributing unit that distributes an occurrence time ratio of the voltage command vector to three basic voltage vectors having a phase difference of 120 degrees including one of the two basic voltage vectors having a phase difference of 60 degrees, using three vectors with equal lengths having a phase difference of 120 degrees and constituting a zero vector corresponding to the voltage command vector, to create three basic voltage vectors having a phase difference of 60 degrees and two zero vectors based on the occurrence time ratio distributed.

35. (New) The apparatus according to claim 33, wherein

the generating unit includes

a creating unit that creates two basic voltage vectors having a phase difference of 60 degrees and at least a zero vector by allocating occurrence time ratios for two basic voltage vectors having a phase difference of 60 degrees with a voltage command vector therebetween and a corresponding zero vector based on the voltage command vector; and

a distributing unit that distributes an occurrence time ratio of the voltage command vector to three basic voltage vectors having a phase difference of 120 degrees including one of the two basic voltage vectors having a phase difference of 60 degrees, using three vectors with equal lengths having a phase difference of 120 degrees and constituting a zero vector corresponding to the voltage command vector, to create three basic voltage vectors having a phase difference of 60 degrees and two zero vectors based on the occurrence time ratio distributed,

while changing occurrence time ratios for the two zero vectors at a predetermined rate.

36. (New) The apparatus according to claim 33, wherein

the generating unit includes

a creating unit that creates two basic voltage vectors having a phase difference of 60 degrees and at least a zero vector by allocating occurrence time ratios for two basic voltage vectors having a phase difference of 60 degrees with a voltage command vector therebetween and a corresponding zero vector based on the voltage command vector; and

a distributing unit that distributes an occurrence time ratio of the voltage command vector to three basic voltage vectors having a phase difference of 120 degrees including one of the two basic voltage vectors having a phase difference of 60 degrees, using three vectors with equal lengths having a phase difference of 120 degrees and constituting a zero vector corresponding to the voltage command vector, to create three basic voltage vectors having a phase difference of 60 degrees and two zero vectors based on the occurrence time ratio distributed, with an occurrence time ratio of a basic voltage vector in a middle of the three basic voltage vectors having a phase difference of 60 degrees set to a predetermined value.

37. (New) The apparatus according to claim 33, wherein

the generating unit includes

a creating unit that creates two basic voltage vectors having a phase difference of 60 degrees and at least a zero vector by allocating occurrence time ratios for two basic voltage vectors having a phase difference of 60 degrees with a voltage command vector therebetween and a corresponding zero vector based on the voltage command vector; and

a distributing unit that distributes an occurrence time ratio of the voltage command vector to three basic voltage vectors having a phase difference of 120 degrees including one of the two basic voltage vectors having a phase difference of 60 degrees, using three vectors with equal lengths having a phase difference of 120 degrees and constituting a zero vector corresponding to the voltage command vector, to create three basic voltage vectors having a phase difference of 60 degrees and two zero vectors based on the occurrence time ratio distributed, while changing occurrence time ratios for the two zero vectors at a predetermined rate with an occurrence time ratio of a basic voltage vector in a middle of the three basic voltage vectors having a phase difference of 60 degrees set to a predetermined value.

38. (New) The apparatus according to claim 34, further comprising:

a switching unit that switches between a first mode and a second mode based on at least one of a load status, an operation frequency, and a range of angle of an inverter rotation angle of an electric motor that is driven by the three-phase voltage inverter, wherein

the first mode generates the three-phase pulse-width-modulation signal using the two basic voltage vectors and the at least a zero vector created by the creating unit, and

the second mode generates the three-phase pulse-width-modulation signal using the three basic voltage vectors and the two zero vectors created by the distributing unit.

39. (New) The apparatus according to claim 35, further comprising:

a switching unit that switches between a first mode and a second mode based on at least one of a load status, an operation frequency, and a range of angle of an inverter rotation angle of an electric motor that is driven by the three-phase voltage inverter, wherein

the first mode generates the three-phase pulse-width-modulation signal using the two basic voltage vectors and the at least a zero vector created by the creating unit, and

the second mode generates the three-phase pulse-width-modulation signal using the three basic voltage vectors and the two zero vectors created by the distributing unit.

40. (New) The apparatus according to claim 36, further comprising:

a switching unit that switches between a first mode and a second mode based on at least one of a load status, an operation frequency, and a range of angle of an inverter rotation angle of an electric motor that is driven by the three-phase voltage inverter, wherein

the first mode generates the three-phase pulse-width-modulation signal using the two basic voltage vectors and the at least a zero vector created by the creating unit, and

the second mode generates the three-phase pulse-width-modulation signal using the three basic voltage vectors and the two zero vectors created by the distributing unit.

41. (New) The apparatus according to claim 37, further comprising:

a switching unit that switches between a first mode and a second mode based on at least one of a load status, an operation frequency, and a range of angle of an inverter rotation angle of an electric motor that is driven by the three-phase voltage inverter, wherein

the first mode generates the three-phase pulse-width-modulation signal using the two basic voltage vectors and the at least a zero vector created by the creating unit, and

the second mode generates the three-phase pulse-width-modulation signal using the three basic voltage vectors and the two zero vectors created by the distributing unit.

42. (New) An apparatus for generating a three-phase pulse-width-modulation signal for a three-phase voltage inverter employing a semiconductor switching element, the apparatus comprising:

a generating unit that generates the three-phase pulse-width-modulation signal based on a combination of three basic voltage vectors and a zero vector and a combination of three basic voltage vectors and two zero vectors.

43. (New) The apparatus according to claim 42, wherein

the generating unit includes

a creating unit that creates two basic voltage vectors having a phase difference of 60 degrees and at least a zero vector by allocating occurrence time ratios for two basic voltage vectors having a phase difference of 60 degrees with a voltage command vector therebetween and a corresponding zero vector based on the voltage command vector; and

a distributing unit that distributes an occurrence time ratio of the voltage command vector to three basic voltage vectors having a phase difference of 120 degrees including one of the two basic voltage vectors having a phase difference of 60 degrees, using three vectors with equal lengths having a phase difference of 120 degrees and constituting a zero vector corresponding to the voltage command vector, to create a first combination of three basic voltage vectors having a phase difference of 60 degrees and a zero vector and a second combination of three basic voltage vectors having a phase difference of 60 degrees and two zero vectors, in a switchable manner.

44. (New) The apparatus according to claim 42, wherein

the generating unit includes

a creating unit that creates two basic voltage vectors having a phase difference of 60 degrees and at least a zero vector by allocating occurrence time ratios for two basic voltage vectors having a phase difference of 60 degrees with a voltage command vector therebetween and a corresponding zero vector based on the voltage command vector; and

a distributing unit that distributes an occurrence time ratio of the voltage command vector to three basic voltage vectors having a phase difference of 120 degrees including one of the two basic voltage vectors having a phase difference of 60 degrees, using three vectors with equal lengths having a phase difference of 120 degrees and constituting a zero vector corresponding to the voltage command vector, to create a first combination of three basic voltage vectors having a phase difference of 60 degrees and a zero vector and a second combination of three basic voltage vectors having a phase difference of 60 degrees and two zero vectors, in a switchable manner, while changing occurrence time ratios for the two zero vectors at a predetermined rate.

45. (New) The apparatus according to claim 43, further comprising:

a switching unit that switches between a first mode and a second mode based on at least one of a load status, an operation frequency, and a range of angle of an inverter rotation angle of an electric motor that is driven by the three-phase voltage inverter, wherein

the first mode generates the three-phase pulse-width-modulation signal using the two basic voltage vectors and the at least a zero vector created by the creating unit, and

the second mode generates the three-phase pulse-width-modulation signal using either one of the first combination and the second combination, in a switchable manner.

46. (New) The apparatus according to claim 44, further comprising:

a switching unit that switches between a first mode and a second mode based on at least one of a load status, an operation frequency, and a range of angle of an inverter rotation angle of an electric motor that is driven by the three-phase voltage inverter, wherein

the first mode generates the three-phase pulse-width-modulation signal using the two basic voltage vectors and the at least a zero vector created by the creating unit, and

the second mode generates the three-phase pulse-width-modulation signal using either one of the first combination and the second combination, in a switchable manner.

47. (New) An apparatus for generating a three-phase pulse-width-modulation signal for a three-phase voltage inverter employing a semiconductor switching element, the apparatus comprising:

a generating unit that generates the three-phase pulse-width-modulation signal based on at least one combination of three basic voltage vectors and at least a zero vector.